CLAIMS

1. A magnetic read head that has a head surface comprising:

a read sensor that forms a portion of said head surface and has first and second side walls which extend into the read head from said head surface;

nonmagnetic electrically insulative first and second read gap layers;

the read sensor being located between the first and second read gap layers;

a read gap material layer having first and second depressions which extend laterally from the first and second side walls respectively of the sensor;

nonmagnetic electrically insulative first and second refill gap layers disposed in the first and second depressions, but not disposed on at least a portion of each of said first and second side walls; and

the first lead layer being electrically connected to said at least a portion of the first side wall and the second lead layer being electrically connected to said at least a portion of the second side wall.

2. A magnetic read head as claimed in claim 1 further comprising:

a ferromagnetic first shield layer;

the first read gap layer interfacing the first shield layer;

a nonmagnetic electrically insulative second read gap layer interfacing the sensor; and

a ferromagnetic second shield layer interfacing the second read gap layer.

3. A magnetic read head as claimed in claim 2 including:

first and second hard bias layers interfacing the first and second refill gap layers and said at least a portion of each of the first and second side walls; and

said first and second lead layers interfacing the first and second hard bias layers.

4. A magnetic head assembly comprising:

a write head;

a read head adjacent the write head comprising:

a read sensor that forms a portion of said head surface and that has first and second side walls which extend into the read head from said head surface;

nonmagnetic electrically insulative first and second read gap layers;

the read sensor being located between the first and second read gap layers;

a first read gap material layer having first and second depressions which extend laterally from the first and second side walls respectively of the sensor;

nonmagnetic electrically insulative first and second refill gap layers disposed in the first and second depressions, but not disposed on at least a portion of each of said first and second side walls;

the first lead layer being electrically connected to said at least a portion of the first side wall and the second lead layer being electrically connected to said at least a portion of the second side wall;

a ferromagnetic first shield layer;

the first read gap layer interfacing the first shield layer;

a nonmagnetic electrically insulative second read gap layer interfacing the sensor; and

a ferromagnetic second shield layer interfacing the second read gap layer.

5. A magnetic head assembly as claimed in claim 4 including:

first and second hard bias layers interfacing the first and second refill gap layers and said at least a portion of each of the first and second side walls; and

said first and second lead layers interfacing the first and second hard bias layers.

6. A magnetic disk drive comprising:

at least one magnetic head assembly;

the magnetic head assembly having a write head and a read head;

the read head including:

a read sensor that forms a portion of said head surface and has first and second side walls which extend into the read head from said head surface;

nonmagnetic electrically insulative first and second read gap layers;

the read sensor being located between the first and second read gap layers;

a read gap material layer having first and second depressions which extend laterally from the first and second side walls respectively of the sensor;

nonmagnetic electrically insulative first and second refill gap layers disposed in the first and second depressions, but not disposed on at least a portion of each of said first and second side walls;

the first lead layer being electrically connected to said at least a portion of the first side wall and the second lead layer being electrically connected to said at least a portion of the second side wall;

a ferromagnetic first shield layer;

the first read gap layer interfacing the first shield layer;

a nonmagnetic electrically insulative second read gap layer interfacing the sensor; and

a ferromagnetic second shield layer interfacing the second read gap layer;

a housing;

a magnetic medium supported in the housing;

a support mounted in the housing for supporting the magnetic head assembly with said head surface facing the magnetic medium so that the magnetic head assembly is in a transducing relationship with the magnetic medium;

a motor for moving the magnetic medium; and

a processor connected to the magnetic head assembly and to the motor for exchanging signals with the magnetic head assembly and for controlling movement of the magnetic medium.

7. A magnetic disk drive as claimed in claim 6 including:

first and second hard bias layers interfacing the first and second refill gap layers and said at least a portion of each of the first and second side walls; and

said first and second lead layers interfacing the first and second hard bias layers.

8. A method of making a read head that has a head surface for facing a magnetic medium comprising the steps of:

forming a nonmagnetic electrically insulative read gap material layer;

forming a sensor material layer on the read gap material layer;

forming a mask on the sensor material layer with a width for defining a track width of the sensor;

milling exposed portions of the sensor material layer to form a sensor with first and second side walls that are spaced apart by said track width;

continuing to mill into the read gap material layer to form the read gap material layer with first and second depressions which extend laterally from the first and second side walls respectively of the sensor;

forming nonmagnetic electrically insulative first and second refill gap layers in the first and second depressions and on the first and second side walls of the sensor;

milling portions of the first and second refill gap layers on the first and second sidewalls until at least a portion of each of the first and second side walls is exposed; and

electrically connecting the first lead layer to said at least a portion of the first side wall and electrically connecting the second lead layer to said at least a portion of the second side wall.

9. A method as claimed in claim 8 further comprising the steps of:

forming a ferromagnetic first shield layer;

forming said first gap layer on the first shield layer;

forming a nonmagnetic electrically insulative second read gap layer on the sensor and the first and second lead layers; and

forming a ferromagnetic second shield layer on the second read gap layer.

10. A method as claimed in claim 9 further comprising the steps of:

interfacing first and second hard bias layers with said at least a portion of the first and second side walls respectively; and

interfacing said first and second lead layers with the first and second hard bias layers.

11. A method as claimed in claim 10 wherein said milling is ion milling at an angle of 70 degrees to a normal to a major plane of the first shield layer.

12. A method of making a magnetic head assembly comprising the steps of:

forming a read head comprising the steps of:

forming a nonmagnetic electrically insulative read gap material layer;

forming a sensor material layer on the read gap layer;

forming a mask on the sensor material layer with a width for defining a track width of the sensor;

milling exposed portions of the sensor material layer to form a sensor with first and second side walls that are spaced apart by said track width;

continuing to mill into the first read gap material layer to form the read gap material layer with first and second depressions which extend laterally from the first and second side walls respectively of the sensor;

sputter depositing nonmagnetic electrically insulative first and second refill gap layers in the first and second depressions and on the first and second side walls of the sensor;

milling portions of the first and second refill gap layers on the first and second sidewalls until at least a portion of each of the first and second side walls is exposed;

electrically connecting the first lead layer to said at least a portion of the first side wall and electrically connecting the second lead layer to said at least a portion of the second side wall;

forming a ferromagnetic first shield layer;

forming said first gap layer on the first shield layer;

forming a nonmagnetic electrically insulative second read gap layer on the sensor and the first and second lead layers;

forming a ferromagnetic second shield layer on the second read gap layer; and

forming a write head on the read head.

13. A method as claimed in claim 12 further comprising the steps of:

interfacing first and second hard bias layers with said at least a portion of the first and second side walls respectively; and

interfacing said first and second lead layers with the first and second hard bias layers.

14. A method as claimed in claim 13 wherein said milling is ion milling at an angle of 70 degrees to a normal to a major plane of the first shield layer.